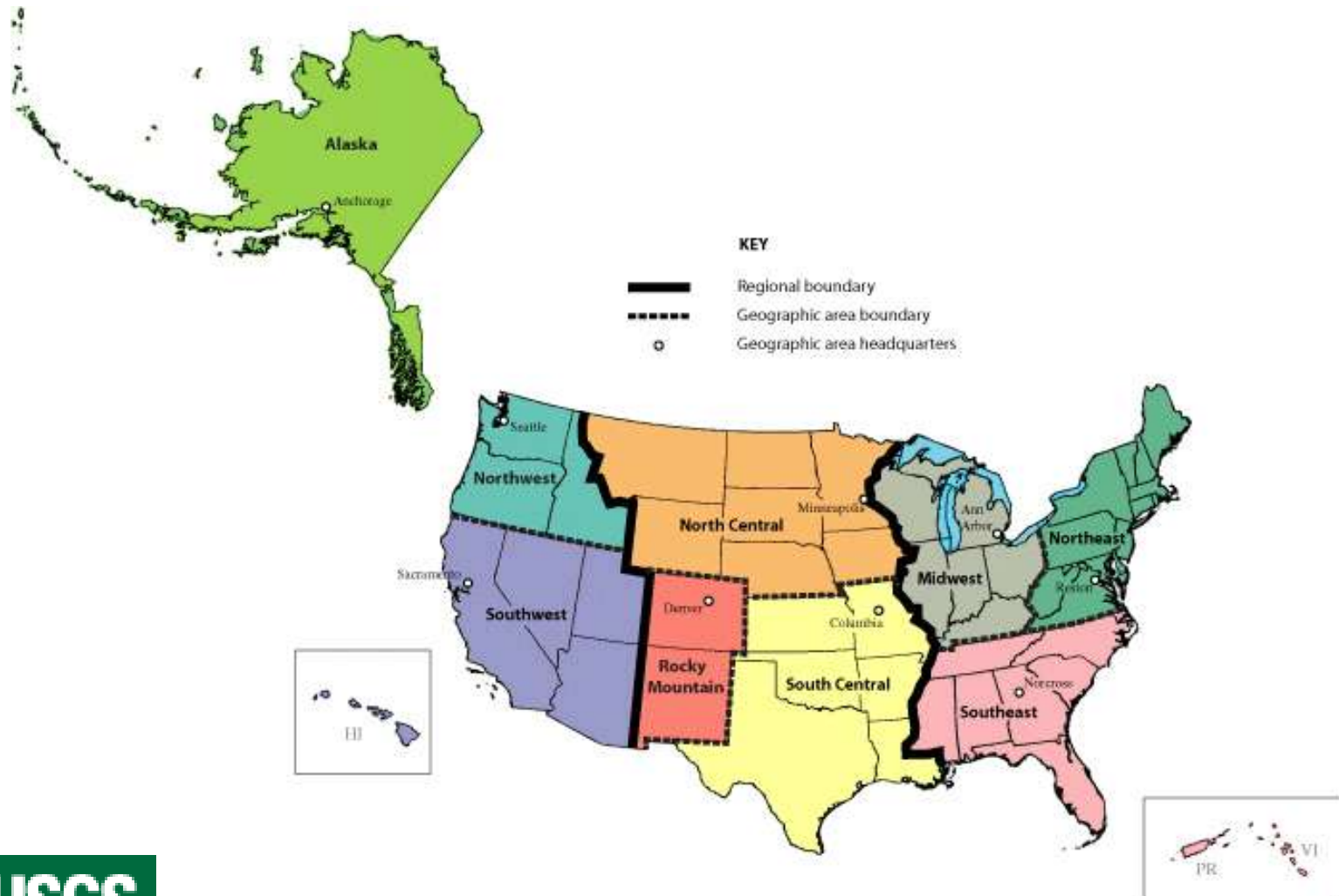# USGS Global Change Science and the DOI SE Climate Science Center

Sonya Jones and Allison Shipp
USGS Southeast and South Central Areas

Strategic Habitat Conservation Workshop
Gulf Coastal Plains and Ozarks
Landscape Conservation Geography
March 23-25, 2010
Jackson, MS

U.S. Department of the Interior
U.S. Geological Survey

http://nccw.usgs.gov/
http:usgs.serap.gov

USGS Areas

USGS Global Change Science

- **National Climate Change and Wildlife Science Center:** A partnership to sustain fish & wildlife communities in natural systems

- **Climate Effects Network:** A vision for a national climate early-warning system

- **Carbon Sequestration:** Geological and biological approaches to understanding the fluxes, sequestration and impacts on human and natural systems

- **Research and Development:** core USGS global change science

National Climate Change & Wildlife Science Center Priorities

- **Analyses** of climate information and derivative products

- **Forecasts of fish and wildlife population and habitat change** in response to climate change

- **Integration** of physical climate information with ecological and habitat response models

- **Standardized approaches** to facilitate linking existing monitoring to climate models and ecological and biological response models

- **Communication -** sharing information across Regional Climate Science Centers and making science products available to natural resource managers

DOI Regional Climate Science Centers

- Cover the Nation (8)

- Science-based

- Multiple LCCs per CSC

- Host location determined by RFI

http://www.doi.gov/whatwedo/climate/strategy/CSC-Map.cfm
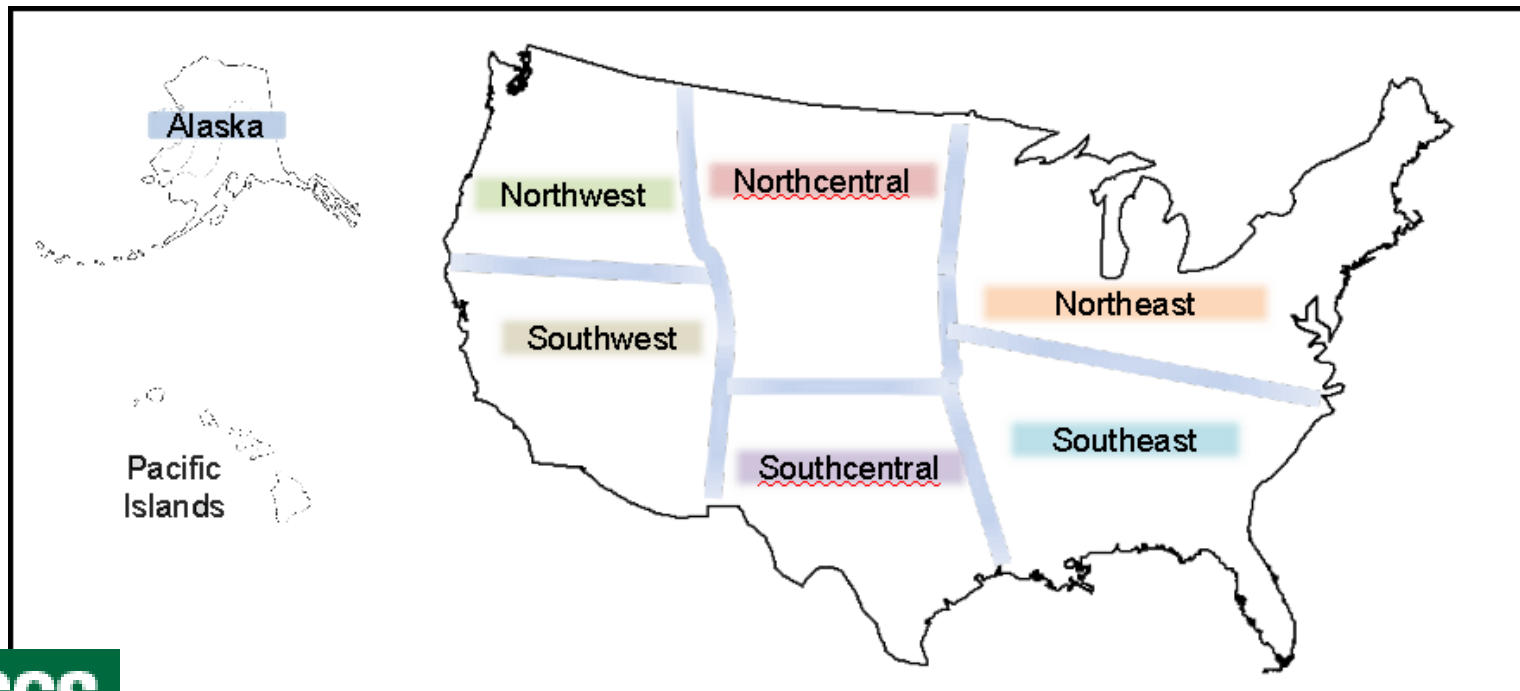
CSC – Staffing Plan

- **Center Director**

- **2 admin staff**

- **1 partnership coordinator (possible position)**

- **~ 5 research scientists**
  - **Scientists skills can vary by CSC**
  - **Scientists could come from other agencies or organizations**

CSC Research and Activities

- **Downscaled climate information** – linked with ecological/biological response models at scales that help managers develop effective adaptive management strategies

- **Regional response modeling and forecasting** of fish and wildlife population and habitat change in response to climate change

- **Derivative products** - that link biological and ecological response variables with physical forcing factors (e.g. temperature and precipitation)

- **Modeling** possible response scenarios for managers to use in an adaptive management framework

CSCs and LCCs

- USGS Commitments to LCCs
  - Research & Modeling
  - Adaptive response forecasts including other drivers
  - Develop monitoring protocols
  - Staff (2 each)

- USGS Benefits from LCC Partnership
  - Strengthening CSC output
  - Builds traditional strengths
  - Partners with other expertise
  - Leverages resources
  - Feeds CEN & other monitoring needs

Southeast Regional Assessment Project

- Integrates climate change, landuse change and sea-level rise projections with habitat and species response models to assess impacts on terrestrial and aquatic species

  - Downscaled Regional Probabilistic Climate Change Projections

  - Integrated Coastal Assessment

  - Integrated Terrestrial Assessment

  - Integrated Aquatic Assessment

  - Optimal Conservation Strategies for Climate Change

  - Dissemination of Climate Change Datasets

SERAP LCCs
- Appalachian (1)
- E Tallgr Pr and Big Rivers (4)
- Gulf Coastal Pl and Ozarks (9)
- North Atlantic (10)
- Peninsular Florida (12)
- South Atlantic (14)
- ACF basin
- SERAP study area
- Sea-level rise study area

SERAP – DOWNSCALING CLIMATE PROJECTIONS

- The goal of this task is to develop the core climatic datasets necessary to project regional ecosystem impacts resulting from 21st century climate change.

    - Downscale IPCC projections of climate variables most relevant to tasks in the project

    - Design and run an Earth Model of Intermediate Complexity (EMIC) to characterize the effects of parametric uncertainty on climate projections

    - Develop a Bayesian data-model to weight the downscaled climate projections according to their performance and the structural uncertainty between models

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SERAP– INTEGRATED COASTAL ASSESSMENT

■ The goal of this task is to demonstrate how knowledge of coastal processes and sea level rise, monitoring, and modeling can be integrated in a manner that supports coastal resource management.

– develop a Bayesian statistical framework for predicting coastal erosion and inundation under a range of sea level rise scenarios that consider the effects of geologic constraints and other forces

– assess the potential impacts of sea level rise on coastal ecosystems and related wildlife resources, and

– develop visualization products that will help natural resource managers anticipate sea level rise and adapt to projected changes

http://gom.usgs.gov/slr/slr.html
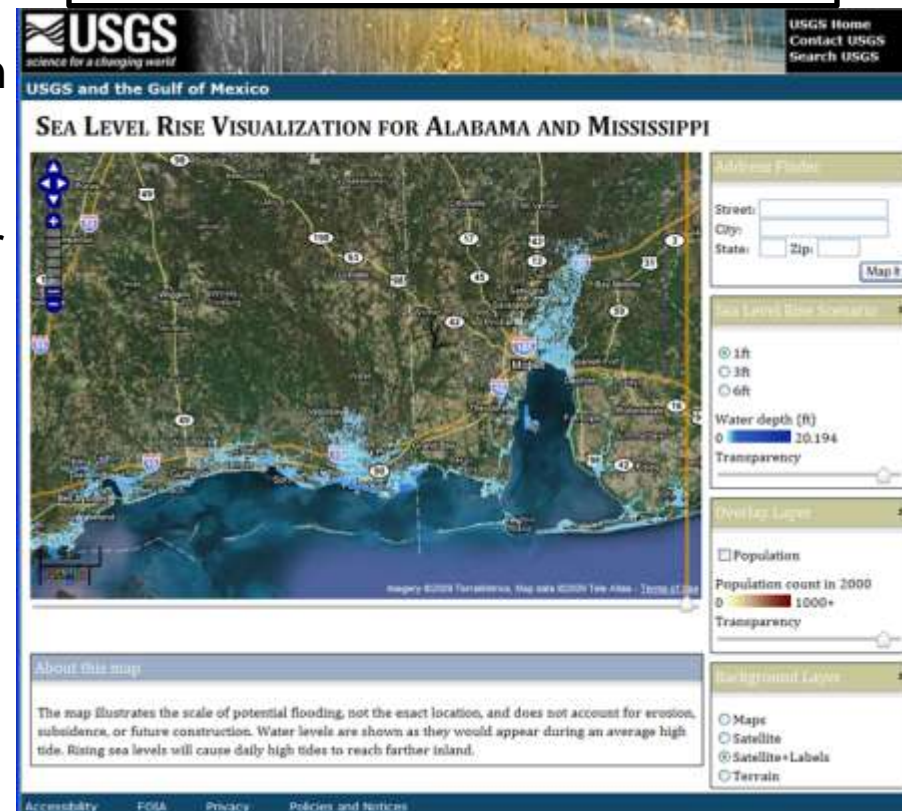
SERAP – INTEGRATED TERRESTRIAL ASSESSMENT

- The goal of this task is to develop a decision making process that accounts for the uncertainty associated with predicting environmental dynamics and population responses.

  – Use projected land cover dynamics and climate change to assess potential impacts on habitats of priority species
  – Assess patch occupancy and range dynamics of North American avian species
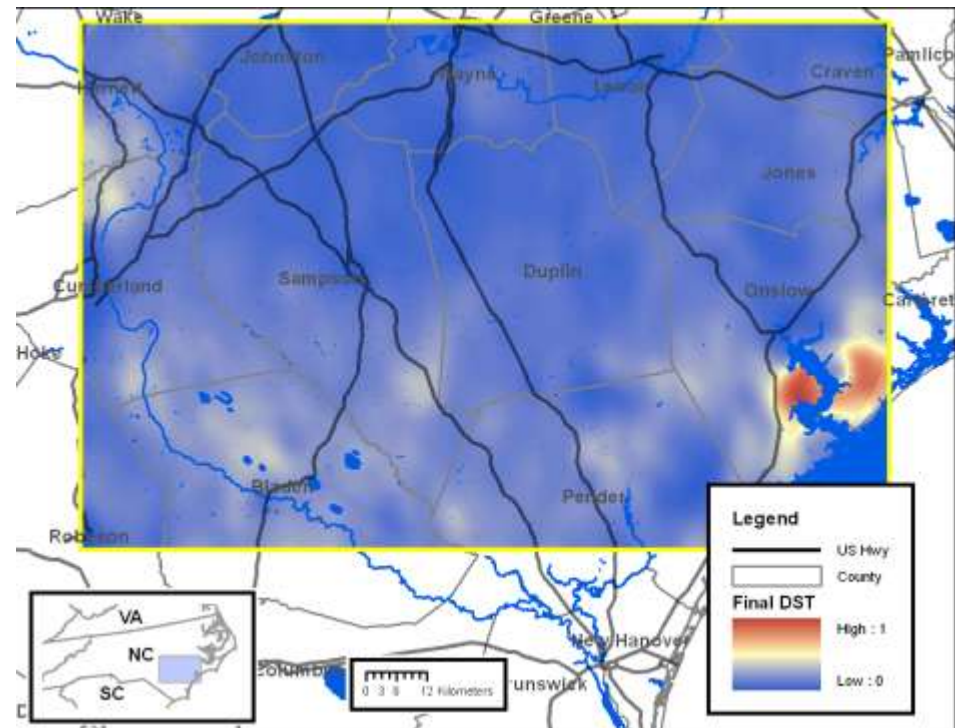

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SERAP– INTEGRATED AQUATICS ASSESSMENT

- The goal of this task is to develop information and modeling approaches to help resource managers assess potential effects of climate change on aquatic species.
  - Develop new multi-scale capabilities for the Precipitation Runoff Modeling System (PRMS), it is a watershed model.
  - Develop geomorphic classification at multiple scales
  - Develop landscape dynamics at multiple scales for improved habitat and process modeling
  - Develop models that use species characteristics to predict vulnerability to changes in flows.
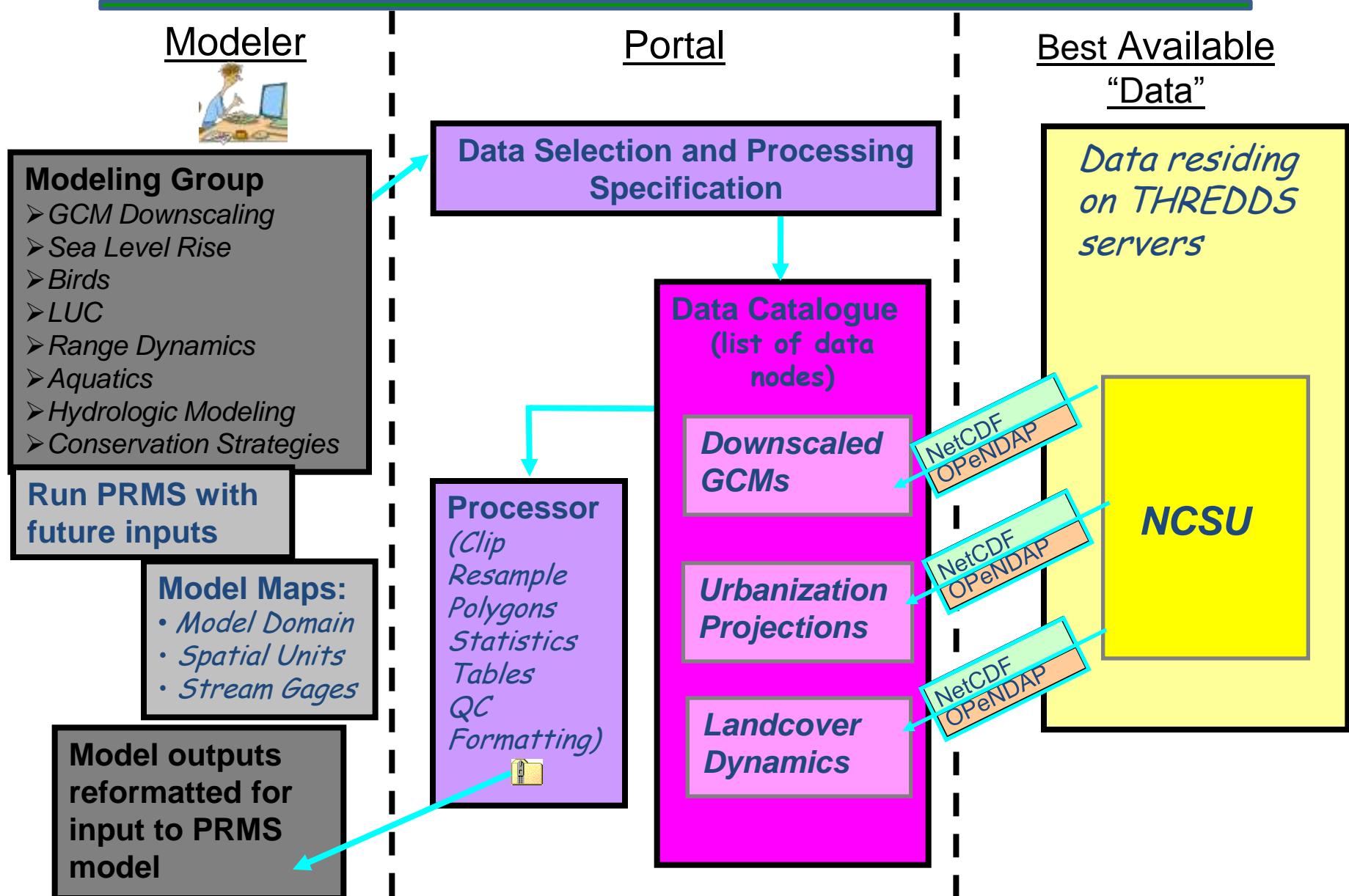
SERAP – OPTIMAL CONSERVATION STRATEGIES FOR CLIMATE CHANGE

- Develop spatially explicit decision support tools to allow management agencies to prioritize conservation actions based on a range of predicted future habitat conditions.

  - Decision models will be used to evaluate "portfolios" of conservation actions
    - ❖ Habitat protection
    - ❖ Manipulation
    - ❖ Propagation in captivity
  - Models include
    - ❖ Landuse change projections
    - ❖ Climate change projections
    - ❖ Vegetation succession

SERAP– DISSEMINATION OF PROJECT DATASETS

Modeler

Portal

Best Available "Data"

Modeling Group
- *GCM Downscaling*
- *Sea Level Rise*
- *Birds*
- *LUC*
- *Range Dynamics*
- *Aquatics*
- *Hydrologic Modeling*
- *Conservation Strategies*

Run PRMS with future inputs

Model Maps:
- *Model Domain*
- *Spatial Units*
- *Stream Gages*

Model outputs reformatted for input to PRMS model

Data Selection and Processing Specification

Processor
(Clip Resample Polygons Statistics Tables QC Formatting)

Data Catalogue (list of data nodes)

Downscaled GCMs

Urbanization Projections

Landcover Dynamics

Data residing on THREDDS servers

NetCDF OPeNDAP

NetCDF OPeNDAP

NetCDF OPeNDAP

NCSU

SERAP– PRODUCTS WE CAN ALL USE

- Downscaled climate models for the SE including temperature, precipitation, and derivate products

- Landuse change projections for the SE for a 100 year time period

- Watershed model for the ACF River Basin, coarse and fine resolution

- Bayesian statistical model for predicting coastal erosion and inundation, sea-level rise impact on coastal ecosystems, and sea-level rise visualization tool

- Habitat and occupancy models for migratory birds, fish, and mussels

- Decision support tools and/or predictive models to implement an integrated landscape approach for conservation strategies

- Portal for modelers and partners to access for best available data and model outputs, design will facilitate loose coupling of models

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